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Science 8

Module 5

Freshwater and Saltwater Systems

Home Instructor's Guide and Assignment Booklet 5B

Learning Technologies Branch

Alberta LEARNING

Science 8
Module 5: Freshwater and Saltwater Systems
Home Instructor's Guide and Assignment Booklet 5B
Learning Technologies Branch
ISBN 0-7741-2378-8

The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Home Instructor's Guide and Assignment Booklet.

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	✓
General Public	
Other	

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- Alberta Learning, **http://www.learning.gov.ab.ca**
- Learning Technologies Branch, **http://www.learning.gov.ab.ca/ltb**
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Section 3: Aquatic Ecosystems and Water Quality

The student looks at some aquatic organisms and their adaptations to the aquatic environment. The student then studies food chains, food webs, and water-borne toxins. The student explores the human impacts on water systems. The student becomes aware of the need to monitor and maintain the quality of global water. Water quality in a body of water can be indicated by the presence of aquatic organisms. The student becomes aware of positive actions that individuals and groups can take to look after water quality.

The following materials will be needed to complete this section.

Section 3: Lesson 1

No extra materials are needed for this lesson.

If completing the final "Going Further" in this lesson, the student is to ask for disposal instructions for surplus fertilizer. Surplus fertilizer may be disposed of in dilute form on a lawn or a garden.

Section 3: Lesson 2

No extra materials are needed for this lesson.

Suggested Answers

Section 3: Lesson 1

17. Bacteria can chemosynthesize food and oxygen from chemicals released from the vents.

18. Textbook questions 3 and 5 of "Topic 5 Review," page 447:

3. High concentrations of nutrients can cause an algal bloom. These can enter the water from these sources:

- using excess fertilizer on crops
- concentrating large numbers of livestock—and wastes—in feedlots
- releasing poorly treated sewage into water sources

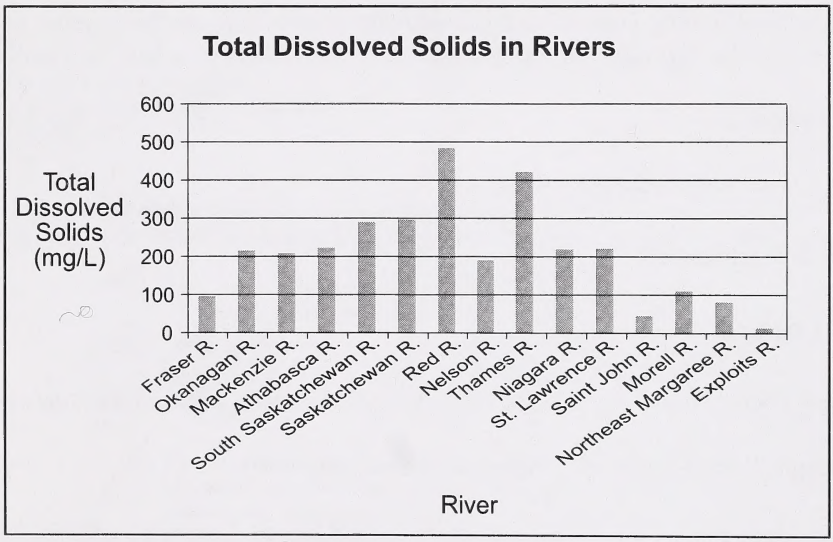
5. Adding or deleting a species in an ecosystem may cause an imbalance through a chain reaction. Depending on the place of the species in the food chain and the availability of other species to fill in the gap, the imbalance may be great or small. The change may also have positive and negative impacts. Consider this example.

You have a small fish tank. It is filled with water plants, algae, and plant-eating fish. The water is clear. You introduce a carnivorous fish. It eats the original fish, but it will not eat the algae or plants. The algae and plants grow vigorously because they are not being eaten. They soon choke themselves from a lack of nutrients. Even if the carnivorous fish is fed by you, it soon dies because it cannot survive in the oxygen-starved water.

Section 3: Lesson 2

3. Textbook questions 1 and 2 of "Procedure," page 450:

1. The bar graph should be neat and done in pencil with a ruler or it may be computer generated. It should have a specific, appropriate title. The horizontal axis would be labelled "River." The vertical axis would be labelled "Total Dissolved Solids (mg/L)." The student's graph should be similar to the following.



2. (a) The following table lines up the rivers to their provinces or territories.

River	Province/Territory
Fraser River	**British Columbia; Newfoundland and Labrador**
Okanagan River	**British Columbia**
Mackenzie River	**Northwest Territories**
Athabasca River	**Alberta**
South Saskatchewan River	**Alberta and Saskatchewan**
Saskatchewan River	**Saskatchewan and Manitoba**
Red River	**Manitoba; Nova Scotia; Nunavut; Yukon; British Columbia**
Nelson River	**Manitoba**
Thames River	**Ontario**
Niagara River	**Ontario**
St. Lawrence River	**Ontario and Quebec**
Saint John River	**New Brunswick**
Morell River	**Prince Edward Island**
Northeast Margaree River	**Nova Scotia**
Exploits River	**Newfoundland and Labrador**

Note: There are two different Fraser rivers in Canada. There are five different Red rivers! The water readings were taken from the best known Fraser River (B.C.) and Red River (Man.)

(b) Manitoba has the hardest river water. This hard water is in the Red River. Newfoundland and Labrador has the softest river water. This soft water is in the Exploits River.

(c) Water is generally softer in the Atlantic provinces than it is in the rest of Canada. Hard water is prevalent throughout the rest of the country, although some soft water—not as soft as the Atlantic provinces—is located in British Columbia and Ontario.

(d) The source of most dissolved solids is the rocks and soils the water flows over and through in the watershed. There are fewer such rocks and soils in soft-water areas. There are more rocks or soils containing salts—such as magnesium and calcium—in hard-water areas.

12. Textbook questions 1 to 3 of "What Did You Find Out?" from page 461:

1. The Red Deer River has better quality water.

2. Answers will vary. The water quality of both rivers changed over the years. Water quality might have changed with the amount of precipitation each year as well as the number and type of human activities. There could also have been spillages from industries or from accidents.

3. Answers will vary. Most pollutants probably came from agriculture, industry, or sewage outflows. Governments can set and enforce standards for environmental contaminants. They can also ban or restrict the use of certain contaminants.

17. Answers will vary but might include the following:

- Don't use toxic chemicals on the lawn.
- Plant vegetation on the edge of waterways.
- Dispose of chemicals appropriately.
- Organize an annual litter removal day.
- Make sure litter goes in a garbage container.
- Report chemical spills or water problems to the local authority.

18. Textbook questions 1, 2, 6, and 7 of "Topic 6 Review," page 468:

1. Factors that affect water quality include oxygen content, types and populations of organisms present, dissolved substances, and suspended solids.

2. Answers will vary. Examples of the effects of human activities include acid rain, urban or agricultural run-off, sewage, inappropriate garbage disposal, release of industrial waste, chemical spills, overuse (wasteful use), and forest removal.

6. Answers will vary. A reduction in water usage would reduce the need for more resources. It is cheaper and easier to reduce usage than it is to obtain new sources of potable water.

7. When water evaporates from lakes, streams, and oceans, the water vapour going into the atmosphere is pure. But any pollutants originally in these water resources stay behind. The evaporated water does return as precipitation. Then the water ends up back in these water resources. There it will again be contaminated if these water resources are not protected or used carefully.

Section 3 Review

Textbook questions 1 to 4, 6, and 7 of "Wrap-up: Topics 5 and 6," page 469:

1. Producers and small organisms at the low end of a food chain absorb toxins. These toxins are passed on to organisms up the food chain. The concentrations of the toxins increase at each higher level of the food chain. Such an increase in concentration of toxins up a food chain is called biomagnification.

2. The statement is false. Some pollutants, like overabundant plant nutrients from agricultural run-off or soil eroded from logging sites, are not toxins.

3. Answers will vary. Examples follow.

   (a) Detritus is organic matter produced by decomposition. Examples include decaying plants and animals.

   (b) Using a bioindicator species is one type of water-monitoring technique.

   (c) Biomagnification is the increase in the concentration of toxic substances at each level of a food chain.

   (d) Water management is necessary to ensure that water remains a sustainable resource—a reliable resource for present and future needs.

   (e) Hard water has a high concentration of dissolved solids (salts).

4. **(a)** In rural areas, sewage is stored in a *septic tank*.

   (b) *Soft water* contains few dissolved solids.

   (c) Water that is safe to drink is called *potable*.

   (d) Scientists conduct *water sampling* to analyze the quality of water.

6. Bioindicators, such as frogs, are very sensitive to toxins in their environment. Decreasing populations, poor health, and low reproduction rates indicate that an environmental problem may be developing.

7. Acid rain

   - causes harmful heavy metals in the soil to dissolve into ground water
   - destroys the tiny root hairs plants use to absorb water and nutrients
   - damages the eggs and young of aquatic or amphibious species
   - corrodes metal surfaces, limestone statues, and buildings (causing further contamination to ground water)
   - reduces soil fertility

Module Review

1. **Textbook questions 2, 7, 10, 13, 18, 19, and 21 of "Unit 5 Review: Understanding Key Concepts," pages 474 and 475:**

   2. Most fresh water is found in a solid state—ice.

   7. **(a)** A valley glacier forms in the mountains when snowfall exeeds snowmelt. As snow builds up, its weight combines with other factors to turn deeply buried snow into ice. High pressure causes ice at the bottom of the glacier to melt, and gravity pulls the ice mass slowly downhill.

   (b) A continental glacier forms in the same way as a valley glacier, but a continental glacier is a sheet of ice that covers a large area of flatter land.

   10. There have been four major ice ages during the past three million years.

   13. A watershed is an area of land that collects precipitation and drains it into a water body and, eventually, an ocean. A well is a hole dug in the ground to access ground water from an aquifer.

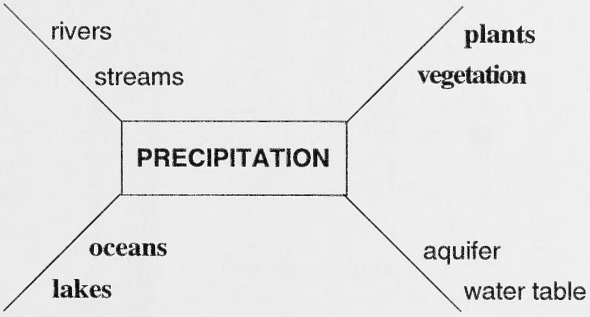
   18. Salinity is the measure of the amount of salt dissolved in water.

19. As water travels from inland to the ocean, it flows over soil and rocks. Small amounts of salts, which are contained in the soil and rocks, dissolve into the flowing water. The water carries these dissolved salts into the ocean. Meanwhile, water evaporates from the ocean and returns to the land as part of the water cycle. The dissolved salts stay in the ocean. As water follows the water cycle, there is no more water added to the ocean. However, there are more salts added to the ocean. That is why the ocean is salty.

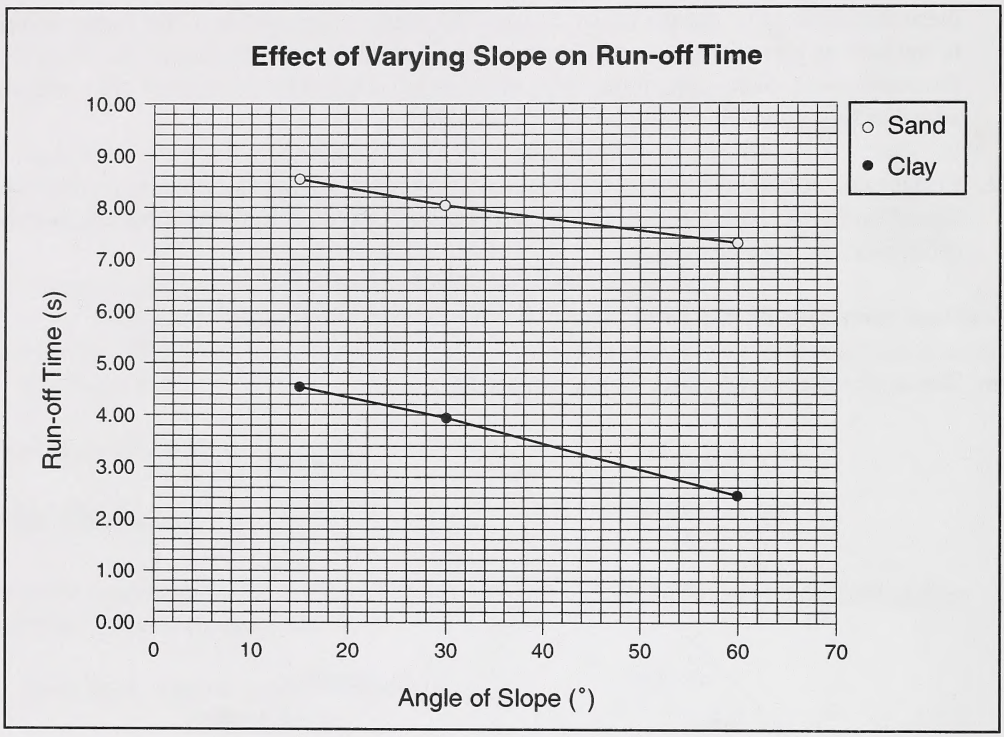
21. Surface currents are created by major winds constantly pushing the water in a particular direction. Earth's rotation also affects these currents. So does water temperature, which creates differences in water density.

2. Textbook questions 28 and 29 of "Unit 5 Review: Developing Skills," page 476:

28. The spider map should look like the following.



29. **(a)** The student's graph should look as follows.



(b) The greater the angle of the slope, the faster the run-off time.

(c) A 60° slope on clay would cause the greatest run-off volume.

3. Textbook question 47 of "Unit 5 Review: Critical Thinking," page 477:

47. Answers will vary. The students should disagree with the statement. Even if fish isn't consumed, the young student likely uses several ocean products, such as carrageenan, algin, and agar (found in toothpaste, salad dressings, puddings, and so on). The ocean plants and phytoplankton are the major producers of the oxygen in the air. A polluted ocean would affect many food webs that spill over into the land environment. Polluted ocean water will pollute shorelines, coastal regions, and eventually inland regions.

ASSIGNMENT BOOKLET 5B

Science 8
Module 5: Section 3 Assignment and Final Module Assignment

Home Instructor's and Student's Comments:

STUDENT FILE NUMBER
(if label is missing or incorrect)

_____

Date Submitted:

_____

Apply Module Label Here

Name

Address

Postal Code

Please verify that preprinted label is for correct course and module.

FOR SCHOOL USE ONLY

Assigned Teacher:

_____

Date Assignment Received:

_____

Grading:

_____

Teacher's Comments

_____

Teacher's Signature

Home Instructor: Keep this sheet when it is returned to you as a record of the student's progress.

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When you register for distance learning courses, you are expected to send in Assignment Booklets for corrections regularly. Try to send each Assignment Booklet as soon as you have completed it. Before sending your Assignment Booklet, please check the following:

- Are all the assignments completed? If not, explain why.
- Has your work been reread to be sure the spelling and details are correct?
- Is the record form filled out and the correct module label attached?

MAILING

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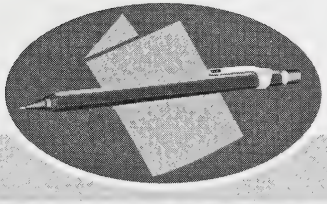
Science 8

Module 5

Freshwater and Saltwater Systems

Assignment Booklet 5B



Learning Technologies Branch

Alberta LEARNING

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Section 3 Assignment	29	
Final Module Assignment	53	
	82	

Teacher's Comments

Science 8
Module 5: Freshwater and Saltwater Systems
Assignment Booklet 5B
Section 3 Assignment and Final Module Assignment
Learning Technologies Branch

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ASSIGNMENT BOOKLET 5B
SCIENCE 8: MODULE 5
SECTION 3 ASSIGNMENT AND FINAL MODULE ASSIGNMENT

Your mark for this module will be determined in part by how well you do your assignments.

This Assignment Booklet is worth 82 marks out of the total 145 marks for the assignments in Module 5. The value of each assignment and each question is stated in the left margin.

Work slowly and carefully. If you have difficulty, go back and review the appropriate section.

Be sure to proofread your answers carefully.

Section 3 Assignment: Aquatic Ecosystems and Water Quality

(29)

Read all parts of your assignment carefully and record your answers in the appropriate places.

1. Some aquatic animals have special appendages. The sea star has tube feet and the freshwater snail has a suction cup for a foot. These are adaptations to a certain condition of the aquatic environment.

(1) **a.** Which condition are these appendages adapted for?

_____

(1) **b.** Describe how these special appendages help the organisms.

_____

_____

(3) **2.** Explain how a whale's blowhole helps the whale live in water.

_____

_____

_____

_____

3. Substances from seaweeds are used in making ice cream, cosmetics, and other materials. Seaweeds are marine plants.

(1) **a.** What structure do seaweeds have to stay attached to the seabed?

_____

(1) **b.** Why don't seaweeds need roots to absorb nutrients from the seabed?

_____

_____

(1) **4.** Which of the following is a special adaptation for life in the water?

A. a shell
B. gills
C. eyes
D. a skeleton

(1) **5.** In Module 1 of this course, you learned that the viscosity of water is greater than the viscosity of air. Which is an adaptation of aquatic animals to the greater viscosity of water?

A. gills
B. a skeleton
C. bright colouration
D. a streamlined shape

6. An algal bloom of a lake may lower the fish population of the lake.

(2) **a.** Explain how an algal bloom may get started.

_____

_____

(3) **b.** Explain how an algal bloom can cause the fish population to go down.

_____

_____

_____

(2) **7.** The fish in Anil's aquarium have been reproducing at a very rapid rate. He decides to release several fish into the sheltered ocean bay just steps away from the family beach house.

Predict if the fish will do well in their new habitat. Support your answer with at least two significant reasons.

_____

_____

_____

_____

(3) **8.** A student studied the growth in aquatic plants in a certain region. The study was over a whole year. The region was in ocean water near the mouth of a river. The student found that there seemed to be seasonal changes in plant growth. In the spring there was rich plant growth. Plant populations increased. In late summer, plant growth slowed down. Plant populations decreased. Explain what could account for these changes in plant growth.

_____

_____

_____

_____

_____

_____

Return to page 57 of the Student Module Booklet and continue with Lesson 2.

Circle the letter of the correct response for questions 9 to 12.

Use the following information to answer question 9.

To investigate water quality, a biologist collected samples of invertebrates from each of four lakes. The living things in the samples were as follows:

Sample 1	caddisfly larvae, midgefly larvae, leeches, snails
Sample 2	crayfish, leeches, snails
Sample 3	crayfish, leeches
Sample 4	crayfish, snails

(1) **9.** Which sample likely came from the lake with the least polluted water?

A. Sample 1
B. Sample 2
C. Sample 3
D. Sample 4

(1) **10.** Hard water contains lots of

A. calcium or magnesium
B. sodium chloride
C. chlorine
D. toxins

(1) **11.** The presence of which species indicates that the water in a stream is clean?

A. beetles
B. crayfish
C. leeches
D. snails

(1) **12.** Which of the following processes can make fresh water from salt water?

A. settling
B. filtration
C. distillation
D. chlorination

13. Identify each purification technique.

(1) **a.** A wire grid is placed across the outlet between a septic tank and its septic field. _____

(1) **b.** As part of its purification process, the local water-treatment plant holds water from the river in large tanks for several days. _____

(1) **c.** An acreage owner pumps well water through layers of gravel, sand, and charcoal. _____

(3) **14.** List three things you can do on your own to help protect Earth's aqueous resources.

_____

_____

_____

_____

_____

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_____

_____

_____

_____

Return to page 69 of the Student Module Booklet and continue with the Module Summary.

53

Final Module Assignment

Read all parts of your assignment carefully and record your answers in the appropriate places.

(1) **1.** Waves colliding with the beach at a slight angle cause currents of water and sand to flow along the beach. These currents are called _____.

(1) **2.** Circle the letter of the best response.

When are tidal movements the largest?

A. in spring
B. when the Sun, Moon, and Earth are in line
C. when the Sun crosses the equator at the equinox
D. when the Sun and Moon are at right angles to each other

(3) **3.** You just discovered a new aquatic organism. You find its blood contains a form of antifreeze. It has a hard coat of scales that will withstand high pressures, it has large feelers but no eyes, and it has fins that are located low on its flattened body.

Describe where this aquatic organism likely lives.

_____

_____

(1) **4.** "Diluting pollutants makes them harmless." Use a single term to explain why this is not true for all pollutants.

_____

5. Suppose that land development has swiftly expanded from a city to within two kilometres of your farm. This occurred during the last five years. You now find that your well often runs dry before you can finish your shower or fill the washing machine.

(2) **a.** List two possible reasons for this problem. Use appropriate scientific terms.

_____

_____

_____

_____

(2) **b.** List two actions you, your family, or your community could take to solve or reduce the problem.

_____

_____

_____

(1)

6. El Niño has recently caused changes in the currents of the Pacific Ocean. Warm water has moved into places that are normally cool. This, in turn, has caused a significant decrease in the squid stocks available to animals and humans. Look at the food web on page 444 of the textbook. Which organism(s) could be affected by this decrease in the squid population?

_____

_____

7. Name the characteristic feature formed when deposition occurs in each of the following:

(1) **a.** a river outlet _____

(1) **b.** the ocean _____

(1) **c.** a glacier _____

8. Issue: "Canadians should sell their water to the United States."

(12) **a.** Selling our water would have environmental, financial, and political costs and benefits. Use resources in the textbook, on the Internet, in the library, and in current publications (for example, magazines, newspapers, and/or government bulletins) to research this issue. You will be required to list two sources other that the textbook. Give a minimum of five specific points in support of this statement (pros) and a minimum of five specific points against it (cons). Focus on scientific facts and numerical data rather than opinions.

Sources:

If you're giving an Internet source, give the complete Internet address, along with the date you accessed the site and the name of the article.

If you're giving a publication source, give the title of the article and the name of the magazine or book, the publisher, the author, and the date of publication.

List at least two sources you used for your research.

_____

_____

_____

_____

Pros (benefits):

List at least five specific points that support selling water to the United States.

Cons (costs):

List at least five specific points against selling water to the United States.

(4) **b.** List at least two alternatives the United States could use to reduce its water-shortage problems that do not involve using Canadian water.

(5) **c.** Use your research information and the concepts from this module to prepare a final statement agreeing or disagreeing with the issue statement. Your statement must be based on fact. Provide a brief explanation of the logic behind your opinion.

(18) **9.** Fill in each answer blank with the correct answer.

a. A(n) _____ may occur in a water body if its watershed contains a large number of crop fields and feedlots. The watershed could be said to have a(n) _____ source of pollution.

b. As _____ increases, the river water will cause more erosion and carry a greater sediment load.

c. When the Moon and the Sun are on opposite sides of Earth, coastal areas will experience _____ tides.

d. _____ become rivers of sand as they erode beaches.

e. The _____ are formed from thick deposits of sediment in the oceans.

f. A(n) _____ must have a layer of _____ rock below it. If water seepage into the ground is too low and water use is too high, the level of the water _____ will fall.

g. When snowfall is greater than snowmelt, a glacier will _____.

h. Water carrying dissolved chemicals drains from continental watersheds into the oceans. As a result, ocean water has a much higher _____ than fresh water.

i. _____ uses high pressure to produce fresh water from salt water.

j. To prevent or reduce the negative consequences of human activity, it is important to _____ water quality and quantity.

k. When the health or population of a(n) _____ drops, its habitat may be polluted.

l. Turbidity usually decreases the _____ of water.

m. A large _____ of warm ocean water keeps the winters along Canada's Pacific coast warmer and moister than the inland areas of British Columbia.

n. The ability to _____ is an adaptation found in several organisms living around ocean vents.

o. Water _____ involves monitoring water quantity and quality, treating water supplies and effluents, and protecting natural water systems.

Submit your completed Assignment Booklet 5B to your teacher for assessment.

ASSIGNMENT BOOKLET DECLARATIONS

The Student's Declaration is to be signed by a student registered at the Alberta Distance Learning Centre. If the student is under 16, the Supervisor's Declaration is to be signed by the student's supervisor, who is usually a home instructor, teacher, or home-schooling coordinator. Failure to complete this page may invalidate the assignment results.

STUDENT'S DECLARATION

- I have followed the instructions outlined in the Student Module Booklet.
- I have completed the activities to prepare myself for the assignments in this Assignment Booklet.
- I completed the assignments in this Assignment Booklet by myself.

_____

Student's Signature

SUPERVISOR'S DECLARATION

I hereby certify that I have supervised the learning activities completed by _____.

Student's Name

I also certify that to the best of my knowledge the assignments in this Assignment Booklet were completed independently by this student.

_____

Supervisor's Signature

If you, the student or supervisor, have any comments or observations regarding this module, write them in the following space.

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COURSE SURVEY FOR SCIENCE 8
(© 2003)

After you have completed the assignments in this course, please fill out this questionnaire and mail it to the address given on the last page. This course is designed in a new distance learning format, so we are interested in your responses. Your constructive comments will be greatly appreciated, as future course revisions can then incorporate any necessary improvements.

Name _____ Age ❑ under 19 ❑ 19 to 40 ❑ over 40

Address _____ File No. _____

_____ Date _____

_____

Design

1. This course contains a series of Student Module Booklets. Do you like the idea of separate booklets?

_____

_____

2. Have you ever enrolled in a correspondence or distance learning course that arrived as one large volume?

❑ Yes ❑ No If yes, which style do you prefer?

_____

_____

3. The Student Module Booklets contain a variety of self-assessed activities. Did you find it helpful to be able to check your work and have immediate feedback?

❑ Yes ❑ No If yes, explain.

_____

_____

4. Were the questions and directions easy to understand?

❑ Yes ❑ No If no, explain.

_____

_____

5. The course material may contain some enrichment or extra help activities. Did you find these activities beneficial?

❑ Yes ❑ No If no, explain.

_____

_____

6. Did you understand what was expected in the Assignment Booklets?

❑ Yes ❑ No If no, explain.

_____

_____

7. The course materials were designed to be completed by students working independently at a distance. Were you always aware of what you had to do?

❑ Yes ❑ No If no, provide details.

_____

_____

8. This distance learning course may include an assortment of drawings, photographs, and charts.

   a. Did you find the visuals in this course helpful?

   ❑ Yes ❑ No Comment on the lines below.

   _____

   _____

   b. Did you find the variety of visuals in this course motivating?

   ❑ Yes ❑ No Comment on the lines below.

   _____

   _____

9. Some activities may have called for the use of an audiocassette, videocassette, or CD. Did you use these forms of media?

❑ Yes ❑ No Comment on the lines below.

_____

_____

10. The Student Module Booklet may have directed you to work with your teacher. How well did you work as a team?

Student's comments: _____

_____

_____

_____

Teacher's comments: _____

_____

_____

_____

Course Content

1. Was enough detailed information provided to help you learn the expected skills and objectives?

❑ Yes ❑ No Comment on the lines below.

_____

_____

2. Did you find the workload reasonable?

❑ Yes ❑ No If no, explain.

_____

_____

3. Did you have any difficulty with the reading level?

❑ Yes ❑ No Please comment.

_____

_____

4. How would you assess your general reading level?

❑ poor reader ❑ average reader ❑ good reader

5. Was the material presented clearly and with sufficient depth?

❑ Yes ❑ No If no, explain.

_____

_____

General

1. What did you like least about the course?

_____

_____

2. What did you like most about the course?

_____

_____

Additional Comments

_____

_____

_____

_____

_____

_____

_____

Only students enrolled with the Alberta Distance Learning Centre need to complete the remaining questions.

1. Did you contact the Alberta Distance Learning Centre for help or information while doing your course?

   ❑ Yes ❑ No If yes, approximately how many times? _____

   Did you find the staff helpful?

   ❑ Yes ❑ No If no, explain.

   _____

   _____

2. Were you able to fax any of your assignment response pages?

   ❑ Yes ❑ No If yes, comment on the value of being able to do this.

   _____

   _____

3. If you mailed your assignment response pages, how long did it take for their return?

   _____

   _____

4. Was the feedback you received from your correspondence or distance learning teacher helpful?

   ❑ Yes ❑ No Please comment.

   _____

   _____

   _____

   _____

Thanks for taking the time to complete this questionnaire. Your feedback is important to us. Please return this questionnaire to the address on the right.

If you are enrolled at the Alberta Distance Learning Centre and will be mailing your Assignment Booklets to ADLC, you may return this questionnaire with the final Assignment Booklet in the course.

Learning Technologies Branch
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Barrhead, Alberta
T7N 1P4

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